REMARKS

This paper is filed in response to the Office Action mailed 11th April 2003. Claims 3 to 22 were pending in the application. Claims 3, 8, 9, 11, and 16 have been amended, claims 4, 7, 10, 12, 15 and 17 to 22 have been cancelled and claims 23 to 26 have been added. Therefore, claims 3, 5, 6, 8 to 9, 11, 13, 14, 16 and 23 to 26 are now pending in the application and are submitted for reconsideration.

Rejection of Claims 3 to22:

Claims 3 to 22 were rejected under 35 U.S.C. § 112 second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In particular, in claims 3 and 11 the Examiner objected to the term "its". This has now been more clearly specified to define the meets and bounds of the invention by use of the term "an operating point of the vehicle".

Claims 3 to 22 were also rejected under 35 U.S.C. § 112 first paragraph because the best mode contemplated by the inventor has not been disclosed.

The Examiner appears to be of the opinion that the person skilled in the art is unable to understand the invention and that there is concealment of the best mode. This is based on the suggestion that the disclosure does not contain any subject matter disclosed in the claims. Accordingly, certain minor amendments have been made to the claims, both to clarify them and also to bring them further into correspondence with the description and figures. Additionally, applicant believes that the explanation provided below will clarify that the best mode known to the applicant is indeed adequately disclosed to the person skilled in the relevant field.

Claims 3 to 22 were also rejected under 35 U.S.C. § 102 (b) as being anticipated by the applicant's own disclosure. The Examiner alleges that the applicant discloses that it is old and well known to solve power optimization problems using well-known optimization algorithms.

Applicant does not believe this allegation to be well-founded. According to the description on page 3, lines 30-34, suitable algorithms are known from the referenced book by Papageorgiou. There is however no suggestion that these algorithms were ever intended

for application to the solution of the power optimization of a vehicle by variation of tractive power within a portion of its trip. The present claims are not directed to an algorithm itself, but to a method of optimizing power for a vehicle in which such an algorithm is merely one component part. Applicant kindly requests the Examiner to reconsider this rejection. A copy of the cited reference by Papageorgiou is presently being requested and will be provided to the Examiner as soon as it becomes available.

Although not relied upon, the Examiner makes reference to US 4,235,402 to Matty et al. This document relates to adhesion and slide control of a rail vehicle and provides no teaching regarding the possibility of determining the dependency of power loss or efficiency on the vehicle operating point. Claim 1 and claim 11 require that a function of operating point versus efficiency or power loss is determined. This function is then optimized using known techniques The detailed explanation of the invention provided below will provide the Examiner with further understanding of the differences between the present application and the prior art according to Matty et al.

According to prior art procedures for operating a rail vehicle, within any single track section, a single value of traction force (usually in the form of a limiting electrical current supply to the motor) is applied to accelerate the train. This may correspond to the driver simply setting the drive to X Kmph whereby maximum acceleration ensues. This results in a generally linear acceleration of the train determined by the mechanical resistance/speed relationship and shown by generally straight upwardly sloping lines in Figure 3. According to the present invention, as a result of applying the optimisation algorithm, the traction (torque) is varied as a function of the speed in order to maximise efficiency (minimise loss). As can be seen from Figure 4, this results in an acceleration which steadily reduces to give a curved speed distance characteristic. This is explained in the description on page 4 from line 27 to line 38. It should be noted in this context, that the variability of the traction force is not simply a "result to be achieved" but an implicit consequence of the application of an optimisation algorithm to a function that will never be completely linear.

The present invention takes advantage of the presence of "time reserves" within the existing schedules to improve efficiency. This has become extremely important within the rail industry. Previously train operators were not charged for the actual energy consumed by their vehicle, calculations being made only on a network basis and attributed to the train operators according to line usage. It has been found, that by optimising the driving mode, energy

savings of up to 50% can be made for the same vehicle on the same journey compared to existing driving modes.

The presence of "time reserves" in this context is implicit to the invention. Without some reserve in the system, no variation in the driving mode could be achieved with respect to an existing "trapezoidal" driving mode covering acceleration, travel at maximum speed followed by maximum braking force. Two types of effective time reserves may be identified: "real" time reserves defined by the time by which the vehicle is planned to arrive at its destination and "implicit" time reserves which may be seen as the speed reserve that the vehicle has by not actually travelling at the maximum speed for the full journey. This "implicit" time reserve can be seen in Figure 3 (attached) as the shaded area in which the vehicle has not reached the allowed maximum speed and has started to coast before reaching its destination.

Prior wisdom was based on the assumption that coasting was the most efficient form of travel. From the characteristics of Figures 1 and 2 (attached) it can be seen that even when coasting (i.e zero tractive force) the power loss is not zero (shaded area in Figures 1 and 2) and increases with speed. It was also generally assumed that the tractive force power loss relationship was substantially linear (the line A in Figure 2 which represents the characteristic of an older type vehicle). This in not the case – in fact in modern vehicles with regenerative braking, the characteristic is generally parabolic and symmetrical whereby power loss increases with the square of the tractive force. According to the features of claim 1 and claim 11, By determining and then maximising the overall efficiency within the constraints of the vehicle characteristics and the journey parameters, full benefit can be derived from the differences between the actual characteristics and the idealised characteristics previously assumed.

On the basis of the above explanation and arguments, applicants respectfully submit that nothing in the art of record teaches or suggests the present invention. Applicants respectfully request withdrawal of the above rejections and allowance of claims 3, 5, 6, 8 to 9, 11, 13, 14 and 16.

New Claims:

Claims 23 to 26 have been added in order to more fully claim the subject matter of Applicants' invention. Support for the new claims can be found in the original specification as filed in the following locations:

New Claim:	Support in Original Specification:
23	Page 4, line 2 to line 12; Figures 1, 2, 4
24	Figures 1, 2
25	Page 4, line 6
26	Page 4, line 36 to line 38; Figure 4

None of the art of record teaches or suggests the combination of features recited in the new claims. In view of the above, Applicants respectfully request entry and allowance of claims 23 to 26 by the Examiner.

*****

Any extension of time that may be deemed necessary to further the prosecution of this application is hereby requested. The Commissioner is authorized to charge any additional fees which may be required, or credit any overpayment, to Deposit Account No. 08-3038, referencing the docket number shown above.

The Examiner is respectfully requested to contact the undersigned by telephone at the number given below in order to resolve any questions.

Respectfully submitted,

David P. Owen
Reg. No. 43,344

Date: 26 Sep 2003

Customer No. 32894
Howrey Simon Arnold & White
CityPoint, One Ropemaker Street,
London EC2Y 9HS
UNITED KINGDOM
Tel: 011 44 20 7628 3303